

CURRENT LISTING OF CLAIMS:

1. (Currently amended) A combined positron emission tomography (PET) and X-Ray computed tomography (CT) apparatus for acquiring PET and CT images with a known geometric relationship between pixels of said images, said combined PET and X-Ray CT apparatus comprising:

a CT scanner including a plurality of detectors, said CT scanner being provided for acquiring CT image data of a desired region of a patient;

a PET scanner including a plurality of detectors, said PET scanner being provided for acquiring PET image data of a desired region of said patient within a field of view having a predefined relationship with a field of view of said CT scanner, so as to establish said known geometric relationship without use of fiducial markers;

a patient support for supporting a patient for imaging by each of said CT scanner and said PET scanner, said patient support being movable within said apparatus such that desired regions of said patient may be imaged both by said CT scanner and by said PET scanner; and

a processor that processes said CT image data and said PET image data to generate at least one of said CT image, said PET image and a fused PET/CT image.

2. (Previously presented) The combined PET and X-Ray CT apparatus of claim 1 wherein said CT scanner is fixed relative to said PET scanner.

3. (Cancelled)

4. (Previously presented) A combined positron emission tomography (PET) and X-Ray CT apparatus as set forth in claim 1, further comprising:

a display device for displaying at least one of said CT image, said PET image and said fused PET/CT image.

Claims 5 – 9 (Cancelled).

10. (Previously presented) A combined positron emission tomography (PET) and X-Ray CT apparatus as set forth in claim 1, wherein said processor further generating attenuation correction factors from said CT image data for correcting said PET image data.

Claims 11-15 (Cancelled).

16. (Previously presented) A combined positron emission tomography (PET) and X-Ray CT apparatus as set forth in claim 1, wherein said processor further correcting said CT image for artifacts due to field of view truncation.

Claims 17-42 (Cancelled).

43. (Currently amended) A combined positron emission tomography (PET) and X-Ray computed tomography (CT) apparatus for acquiring PET and CT images with a known geometric relationship between pixels of said images, said combined PET and X-Ray CT apparatus comprising:

CT image means for acquiring a CT image, said CT image means including a plurality of detectors;

PET image means for acquiring a PET image, said PET image means including a plurality of detectors mounted in fixed relationship to said CT image means so as to establish said known geometric relationship without use of fiducial markers;

patient gantry means for use with both said CT image means and said PET image means;

patient support means for supporting a patient positioned within said patient gantry means, said patient support means being movable axially within said patient gantry means; and

display means for displaying at least one of a reconstructed CT image, a reconstructed PET image and a fused PET/CT image generated by said combined PET and X-Ray CT apparatus.

44. (Previously presented) A combined positron emission tomography (PET) and X-Ray computed tomography (CT) apparatus as set forth in claim 43, further comprising:
processor means for reconstructing said CT image to achieve a reconstructed CT image, for reconstructing said PET image to achieve a reconstructed PET image, and for generating a fused PET/CT image.

Claims 45 - 48 (Cancelled).

49. (Currently amended) A method for acquiring PET and CT images, comprising the steps of:
placing a patient on a patient support;
moving said patient support to position the patient within a CT scanner patient gantry such that a selected region of said patient to be imaged is within a field of view of a CT scanner associated with said CT scanner patient gantry;
acquiring CT image data of the selected region of the patient;
moving said patient support to position the patient within a PET scanner patient gantry such that said selected region to be imaged is within a field of view of a PET scanner associated with said PET scanner patient gantry;
acquiring PET image data of the selected region of the patient; and
reconstructing a PET image from said acquired PET image data and using said acquired CT image data in the reconstruction of said PET image, to achieve a reconstructed PET image.

50. (Previously presented) The method of claim 49, further comprising the step of continuously moving said patient support in an axial direction within said PET scanner patient gantry, whereby normalization effects between individual detector rings of said PET scanner are eliminated.

51. (Previously presented) The method of claim 49 wherein said CT scanner patient gantry is separate from and fixed relative to said PET scanner patient gantry, said patient support being movable between said CT scanner patient gantry and said PET

scanner patient gantry, whereby said step of acquiring CT image data of the selected region of the patient is accomplished within said CT scanner patient gantry, and whereby said step of acquiring PET image data of the selected region of the patient is accomplished within said PET scanner patient gantry.

52. (Previously presented) The method of claim 49 wherein said CT scanner patient gantry is separate from said PET scanner patient gantry, wherein at least one of said CT scanner and said PET scanner is movable with respect the other, and wherein said patient support is movable between said CT scanner patient gantry and said PET scanner patient gantry, whereby said step of acquiring CT image data of the selected region of the patient is accomplished within said CT scanner patient gantry, and whereby said step of acquiring PET image data of the selected region of the patient is accomplished within said PET scanner patient gantry.

53. (Original) The method of claim 52 wherein said step of moving said patient support to position the patient within said CT scanner patient gantry is accomplished by moving said CT scanner to receive said patient bed within said CT scanner patient gantry.

54. (Original) The method of claim 52 wherein said step of moving said patient support to position the patient within said PET scanner patient gantry is accomplished by moving said PET scanner to receive said patient bed within said PET scanner patient gantry.

55 (Cancelled).

56. (Previously presented) The method of claim 49, further comprising the step of correcting said CT image data for artifacts due to field of view truncation.

57. (Previously presented) The method of claim 56 wherein said step of correcting said CT image data includes the steps of:

obtaining non-corrected PET image data, determining a boundary of a truncated portion of the selected region of the patient using a non-corrected PET image reconstructed from said non-corrected PET image data;

estimating a volume within said boundary of the truncated portion of the selected region using an average linear attenuation coefficient for the truncated portion of the selected region; and

adding said volume to said CT image data.

58. (Previously presented) The method of claim 49 further including the step of displaying at least one of said reconstructed CT image and said reconstructed PET image.

59. (Previously presented) The method of claim 49 further including the step of fusing said reconstructed CT image and said reconstructed PET image to achieve a fused PET/CT image.

60. (Previously presented) The method of claim 49, further comprising the step of continuously moving said patient support in an axial direction within said PET scanner patient gantry, whereby normalization effects between individual detector rings of said PET scanner are eliminated.

61. (Previously presented) The method of claim 49 wherein said CT scanner patient gantry is separate from and fixed relative to said PET scanner patient gantry, said patient support being movable between said CT scanner patient gantry and said PET scanner patient gantry, whereby said step of acquiring CT image data of the selected region of the patient is accomplished within said CT scanner patient gantry, and whereby said step of acquiring PET image data of the selected region of the patient is accomplished within said PET scanner patient gantry.

62 - 64. (Cancelled).

65. (Previously presented) A method for acquiring PET and CT images as set forth in claim 49, further comprising the step of:

generating attenuation correction factors for said PET image from said acquired CT image data and using said attenuation correction factors to reconstruct a corrected PET image.

66. (Previously presented) The method of claim 65, further comprising the step of correcting said CT image data for artifacts due to field of view truncation.

67. (Previously presented) The method of claim 66 wherein said step of correcting said CT image data includes the steps of:

obtaining non-corrected PET image data,

determining a boundary of a truncated portion of the selected region of the patient using a non-corrected PET image reconstructed from said non-corrected PET image data;

estimating a volume within said boundary of the truncated portion of the selected region using an average linear attenuation coefficient for the truncated portion of the selected region; and

adding said volume to said CT image data.

68. (Original) The method of claim 65 wherein said step of generating attenuation correction factors from said reconstructed CT image is performed using the steps of:

estimating an attenuation image at 511 keV using a threshold to separate out a bone component of said reconstructed CT image; and

scaling said bone component using a first scaling factor and a non-bone component of said reconstructed CT image using a second scaling factor.

69. (Original) The method of claim 65 further including the step of displaying at least one of said reconstructed CT image and said reconstructed PET image.

70. (Original) The method of claim 65 further including the step of fusing said reconstructed CT image and said reconstructed PET image to achieve a fused PET/CT image.

71. (Previously presented) The method of claim 65, further comprising the step of continuously moving said patient support in an axial direction within said PET scanner patient gantry, whereby normalization effects between individual detector rings of said PET scanner are eliminated.

72. (Previously presented) The method of claim 65 wherein said CT scanner patient gantry is separate from and fixed relative to said PET scanner patient gantry, said patient support being movable between said CT scanner patient gantry and said PET scanner patient gantry, whereby said step of acquiring CT image data of the selected region of the patient is accomplished within said CT scanner patient gantry, and whereby said step of acquiring PET image data of the selected region of the patient is accomplished within said PET scanner patient gantry.

73. (Previously presented) The method of claim 65 wherein said CT scanner patient gantry is separate from said PET scanner patient gantry, wherein at least one of said CT scanner and said PET scanner is movable with respect the other, and wherein said patient support is movable between said CT scanner patient gantry and said PET scanner patient gantry, whereby said step of acquiring CT image data of the selected region of the patient is accomplished within said CT scanner patient gantry, and whereby said step of acquiring PET image data of the selected region of the patient is accomplished within said PET scanner patient gantry.

74. (Original) The method of claim 73 wherein said step of moving said patient support to position the patient within said CT scanner patient gantry is accomplished by moving said CT scanner to receive said patient bed within said CT scanner patient gantry.

75. (Original) The method of claim 73 wherein said step of moving said patient support to position the patient within said PET scanner patient gantry is accomplished by moving said PET scanner to receive said patient bed within said PET scanner patient gantry.

76-90 (Cancelled).

91. (Previously presented) The method of claim 65 wherein said step of reconstructing said attenuation-corrected PET image is accomplished using a Fourier rebinning technique and then independently by an ordered-subset EM iterative reconstruction algorithm.

92-98 (Cancelled).

99. (Previously presented) A method for acquiring PET and CT images as set forth in claim 49, further comprising the step of:
correcting said PET image for scatter to achieve a scatter-corrected PET image.

100-144 (Cancelled).

145. (Previously presented) A method for acquiring at least a PET image within a PET apparatus including at least a PET scanner disposed within a patient gantry, and a patient support for supporting a patient positioned within said patient gantry, comprising the steps of:

moving said patient support to position the patient within said patient gantry such that a selected region to be imaged is within a field of view of said PET scanner;

acquiring PET image data of the selected region of the patient;

continuously moving said patient support in an axial direction within said patient gantry during said step of acquiring PET image data, whereby normalization effects between individual detector rings of said PET scanner are eliminated;

correcting said PET image data for scatter to achieve scatter-corrected PET image data;

applying attenuation correction factors to said scatter-corrected PET image data to achieve attenuation-corrected PET image data; and

reconstructing an attenuation-corrected PET image from said attenuation-corrected PET image data.